

CHEMISTRY

LOWER SECONDARY CURRICULUM

PROJECT-BASED LEARNING AND ASSESSMENT

- Refers to students designing, planning, and carrying out activities that produce a publicly-exhibited output.
- It is an inquiry-based as well as problem-based learning.
- Its uniqueness is a publicly-exhibited output which may be a physical product, publication or presentation.

Learning outcomes

- These a set of qualities learners should demonstrate (know, understand, appreciate or do) at the end of each activity in a given topic.
- They are summarized as **KUSVA**;

Knowledge,

Understanding,

Skills,

Values and

Attitudes.

ACTIVITY OF INTEGRATION

- This is the end of topic assessment designed to examine whether the learner has achieved the competency or all the learning outcomes at the end of a topic.
- It is the last summative activity which evaluates the learner's understanding of the topic.
- A combination of activities of integration at the end of the cycle contributes 20% of the national assessment.

CRITERION REFERENCED ASSESSMENT

- The assessment of activities of integration is a criterion referenced assessment
- Its a four component criterion, summarized as **RACE**;
 - **Relevance**: Here, the connection of content to the topic is considered.
 - **Accuracy**: Here, the facts are considered.
 - **Coherency**: Here, the flow and interconnection of facts is considered.
 - **Excellency**: Here, the distinguishing features portrayed by students are considered.

An assessment Grid is used to award scores with use of **identifiers** and **descriptors**

Identifiers

These are the numbers 1, 2 and 3 which indicate the performance levels of students in each criterion.

- Identifier **1** indicates that **few** learning outcomes (LOs) have been achieved.
- Identifier **2** indicates that **some** learning outcomes (LOs) have been achieved.
- Identifier **3** indicates that **all** learning outcomes (LOs) have been achieved.
- Note that '**0**' cannot be an identifier because each student contributes something in his/her own ability if present in the lesson activity.

Descriptors

- These are the words which explain how each criterion is awarded an identifier.
- They allow a reliable interpretation of the output and ensure consistency.
- When the descriptors and identifiers are well defined, the same output can easily be assessed by any of the facilitators at any time. In short;
 - **The maximum identifier (score) for Relevance, accuracy and coherency is 3**
 - **The least identifier (score) for Relevance, accuracy and coherency is 1**
 - **The maximum identifier for Excellency is 1.**
 - **A student either has 1 or not but not '0'.**

Computation of results in the criterion referenced assessment.

Output	Basis of evaluation	Relevance	accuracy	coherency	excellency
Exhibited product	A	x/3	x/3	x/3	x/1
	B	x/3	x/3	x/3	x/1
	C	x/3	x/3	x/3	x/1

A sample assessment grid for an activity of integration

Output	Basis of evaluation	Relevance	Accuracy	Coherency	Excellency
POSTER	Features of a poster	-5-6 features	-Correct tittle -Right content -Well designed -Contact of producer -visible	-Correct tittle -Right content -Contact of producer -Well designed -visible	Persuasive information or eye catching
		-3-4 features	-Correct tittle -Right content -Contact of producer -visible	Correct tittle -Right content -Contact of producer -visible	
		-1-2 features	-Correct tittle -Right content	Correct tittle -Right content -visible	

Questions that your final assessment should address.

- Does the product meet or exceed the criteria we set at the start of the activity?
- Has the student developed the skills required for the execution of this activity?
- Has the student learned the curriculum content required for this project?

- Note that an assessment tool is being designed
- Topics, learning outcomes, expected competences as well as their indicators were sorted out
 - the ones that can best be assessed as continuous assessment (CA) at school and
 - those that can best be assessed by pen and paper (PP) at UNEB.
- CA demands the actual honesty and integrity of teachers.

A sample of the continuous assessment tool

Topic	Learning outcomes	competence	indicators	Descriptors

A sample report of assessment as feedback to parents.

ABC SECONDDDARY SCHOOL SCHOOL ADDRESS CONTACTS																						
END OF TERM REPORT CARD																						
Name of Student: Moses M						Sex: M																
Class: S.1		Stream: East		Term: I		Year: 2020																
House: _____						Print Date: 23-Feb-20																
End of Unit Progressive Assessment Score Identifiers																						
	U1	U2	U3	U4	U5	U6	U7	U8	U9	TTL Points	Out of 70	TR										
ENGLISH	3	1	2	1	1	2				10	11.1	MS										
GEOGRAPHY	0	1	3	3	1					08	10.7	DH										
KISWAHILI	3	3	3	2	1	3	2	1		18	15.0	BN										
MATHEMATICS	2	1	2	2	3					10	13.3	MN										
PHYSICS	2	3	2	2	3	2				14	15.6	TD										
CHEMISTRY	2	2	1	2	2	2	3			14	13.3	GK										
BIOLOGY	0	3	3	2	1					09	12.0	GS										
HISTORY / POL. EDUC.	2	1	1	3	2					09	12.0	NF										
PHYSICAL EDUCUCCATION	1	3	2	2	3					11	14.7	GS										
ENTREPRENUERSHIP	2	3	1	2	0	2	1	2		13	10.8	DG										
RELIGIOUS EDUCATION	1	1	2	3	2	2				11	12.2	RN										
AGRICULTURE																						
ICT																						
PERFORMING ARTS	1	1	2	3	2	1	2			12	11.4	MN										
LUGANDA																						
AVERAGE POINTS SCORED										11.6												
Key to Terms Used: <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Identifiers</th> <th>Descriptor (What it means)</th> </tr> </thead> <tbody> <tr> <td>0</td> <td>No Learning outcomes achieved - learner was absent</td> </tr> <tr> <td>1</td> <td>Some LOs achieved but not sufficient for overall achievement</td> </tr> <tr> <td>2</td> <td>Most LOs achieved, enough for overall learning achievement</td> </tr> <tr> <td>3</td> <td>All LOs achieved achievement with ease</td> </tr> </tbody> </table> LO = Learning Outcomes U1 = Unit 1 Assessment , etc.													Identifiers	Descriptor (What it means)	0	No Learning outcomes achieved - learner was absent	1	Some LOs achieved but not sufficient for overall achievement	2	Most LOs achieved, enough for overall learning achievement	3	All LOs achieved achievement with ease
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Class Teacher's Comment: _____						Signature: _____																
Head Teacher's Comment: _____																						
Next Term Fees: _____						Balance: _____		Total: _____														
								Signature: _____														
This Term has ended on: _____						Next term begins on: _____																

ITEM DEVELOPMENT

It goes through the following stages:

- 1.Content frame work development
- 2.Test frame work development
- 3.Item specification development
- 4.Scenario development
- 5.Item development

CONTEXTUALISED ITEMS

- Real world/life situations are used by mimicking society eg “as chair person LCV”
- how problems /challenges present themselves in the society eg famine drought disease poverty
- it should be genuine and authentic. It's not authentic if the response does not require the context.

Consider the process occurring in the mind of the test taker when they are responding to the item.

1. Learning before assessment (preexisting knowledge required is evoked)
2. Reading the item
3. Searching
4. Matching
5. Generating the response
6. Writing the response

- Limit as much as possible unintended responses
- the right thinking should be evoked.
- Focus the item to activate relevant aspects to the main issues addressed
- avoid as much as possible associative reasoning being attracted

ATTRIBUTES OF THE ITEMS

- Element of construct it addresses must be clear.
- It should cover several competences from more than one topic.
- The level of demand as per item specification should be known.

ATTRIBUTES OF THE ITEMS

- Item should have the following characteristics;
 - Problem to be solved should be clear
 - Scenario should be in item taker's experience
 - It should be authentic
 - It should be complex enough

- It should bear a relevant support
- The task should be well aligned with scenario
- Length of scenario appropriate as per the item specification
- Language used should be precise and concise
- It should be fair without favouring categories of test takers
- Scenario item should be original
- Scenario / context should evoke expected response
- Scoring criteria should be in line with the basis of assessment

ELEMENTS OF CONSTRUCT	TOPICS	COMPETENCES	LEVEL OF DEMAND
Appreciates the contribution of chemistry to our economy	Industrial processes (page 39)	a, b, c, d(I, ii), e, f(i, ii, ii), g, h, i, j.	AN
	Carbon in life (page 31)	b(i, ii), g(i, ii),	
	Air (page 21)	a(ii),b	

ELEMENTS OF CONSTRUCT	TOPICS	COMPETENCES	LEVEL OF DEMAND
Appreciates the application of chemistry in daily life	Chemistry and society (page 15)	a, b(i, ii)	EV
	Chemicals for consumers (page 42)	a(i, ii), b, c, d	
	Nuclear processes (page 43)	a(i, ii, iii, iv), b, c	

ELEMENTS OF CONSTRUCT	TOPICS	COMPETENCES	LEVEL OF DEMAND
Appreciates diversity and interactions of substances and their importance in life	The periodic table (page 27)	a(ii,ii), b, c, d	AL
	Trends in the periodic table (page 40)	a, b, c	
	Structures and bonds	a, b, c, d, e, f, g	
	Structures and properties of substances (page 36)	a, b, c	
	Air (page 21)	c	
	Carbon in life (page 31)	a, c , d, e(I, ii), f	
	Using materials (page 18)	a, b, c, d, e, f, g	

ELEMENTS OF CONSTRUCT	TOPICS	COMPE TENCES	LEV EL OF DE MA ND
Appreciates the existence of natural resources in the environment and their importance in everyday life	Air (page 21)	a(i)	CR
	Water (page 23)	a(i, ii, iii), b, c	
	Rocks and minerals (page 24)	a(i, ii), b(i, ii), c	
	Carbon in the environment (page 28)	a(i, ii), b(i, ii), c, d	
	Fossil fuels (page 37)	a(i, ii)	

	ELEMENTS OF CONSTRUCT	TOPICS	COMPETENCES	LEVEL OF DEMAND
	Understands that chemistry is a process of evidence-based enquiry involving the collection of evidence and the development of theories that help us explain the evidence (science process skills)	Experimental chemistry (page 16)	a(i, ii), b(i, ii), c, e, f	CR
		Acids and alkalis (page 25)		
		Salts (page 26)		
		Chemical reaction rates (page 37)	b(ii), c	
		Energy changes during chemical reactions (page 41)		
		Formulae, stoichiometry and mole concept (page 34)		
		Oxidation and reduction reactions (page 38)	a(i, ii), b, c	
		The reactivity series (page 30)		
		Carbon in life (page 31)	h(i, ii), i(i, ii)	
		Chemistry and society (page 15)	c(i)	
		Carbon in the environment (page 28 cv)	d(i)	

• METHODS OF SCIENTIFIC INVESTIGATION

- Make observations from the environment
- State the hypothesis of the problem
- Design an experiment to investigate the problem
 - Aim of the experiment,
 - Requirements for the experiment,
 - Procedure for the experiment,
 - Data from the experiment,
 - Analysis of the data,
 - Conclusion drawn from the experiment.

BASIS OF ASSESSMENT	ASSESMENT CRITERIA	SCORE
Aim of the experiment ¹	Correct aim of the experiment	01
	Incorrect aim of the experiment	00
Variables for the experiment	dependent variable	01
	Independent variable	01
	Controlled variable	01
	How it is controlled	01
	Not controlled	00
Hypothesis ¹	Hypothesis related to the experiment	01
Selection of equipment	Relevant apparatus	02
	Mixed apparatus	01
	Irrelevant apparatus	00
Procedure of experiment	Procedure completely relevant to the experiment	02
	Procedure partially relevant to the experiment	01
	Procedure not relevant	00
	Coherent procedure	02
	Partially coherent	01
	Procedure not coherent	00
	identification of most of the risks with their mitigation	02
	identification of a few risk / partial risks with their mitigation	01
	no risk identified	00

Presentation of data	Appropriate presentation of data 02	02
	Partially appropriate recording of data 01	01
	Inappropriate recording of data 00	00
	Maximum required sets of presented data 03	03
	Half of the required sets of data presented 02	02
	Less than half of the required sets of data presented 01	01
	No set of data presented 00	00
	Data presented within an error margin of $< + 0.5$ 02	02
	Data presented within an error margin of $< +1.0$ 01	01
	Data presented within an error margin of $> + 1.0$ 00	00
Data analysis and interpretation	Method used to process data is appropriate 02	02
	Method used to process data is partially appropriate 01	01
	Method used to process data is inappropriate is inappropriate 00	00
	Method used to process data is accurate 02	02
	Method used to process data is partially accurate 01	01
	Method used to process data is inaccurate 00	00
Conclusion	Conclusion based on data interpretation 02	02
	Conclusion not based on data interpretation 01	01
	No conclusion based on data interpretation 00	00

Charcoal is a fuel used in most homes throughout the country. Government however is always against the business. Your school will participate in this year's international environment day under the theme "Use of charcoal is cheap and sustainable if made from wood".



As an environmental chemist prepare a speech for 20 minutes on the theme and description to the guests on how charcoal is made.

Basis of assessment	Criteria	scoring	Total score
Identity	Categories the natural resources into renewable 01 Not categorized into renewable 00	01 00	X1
Composition of the natural resource	All the components 02 Partial composition 01 No composition 00	02 01 00	X2
Interaction with other substances	Observation 01 Equation 01	01 00	X2
Impact to the environment	How it occurs 01 Its effects 01 How it is mitigated 01	03 02 01	X3
Importance of natural resources in our everyday life	Two and more importance 02 At least one importance 01 No importance given 00	02 01 00	X2
			10

EXPECTEDRESPONSE

Good morning everyone,

On this international Environment Day, I am here to talk about the use of charcoal and its impact on our environment. Charcoal has been used for centuries as a fuel source, and it is still used in many parts of the world, particularly in developing countries where it is considered a cheap and sustainable source of energy. However, the question we need to ask ourselves is whether the use of charcoal is really sustainable and what impact it has on our environment.

Charcoal is typically made from wood, which is a renewable resource. However, the way in which charcoal is produced can have significant environmental impacts. Traditional charcoal production involves cutting down trees, which can lead to deforestation and loss of habitat for wildlife. In addition, the burning of wood releases carbon dioxide into the atmosphere, which contributes to climate change.

However, there is a way to make charcoal that is both sustainable and environmentally friendly. This is known as sustainable charcoal production. Sustainable charcoal production involves using wood from sustainably managed forests or using waste wood from other industries, such as sawmills or furniture factories.

Sustainable charcoal production also involves using efficient and clean burning technologies, such as retort kilns, which can reduce emissions of harmful pollutants, such as carbon monoxide and particulate matter. This not only helps protect our environment but also improves the health and well-being of those involved in charcoal production.

One of the major advantages of sustainable charcoal production is that it can provide a reliable source of income for local communities, particularly in developing countries. Using waste wood or sustainably managed forests can help to reduce deforestation and provide a valuable source of income for local communities.

Another advantage of sustainable charcoal production is that it can help to reduce our dependence on fossil fuels, which are finite resources and contribute to climate change.

Charcoal can be used as a substitute for coal in industrial processes, such as steel production, and can also be used as a fuel source in cooking and heating.

However, there are still challenges that need to be addressed to ensure that sustainable charcoal production becomes more widespread. One of the challenges is the lack of awareness and education about the benefits of sustainable charcoal production, particularly among consumers. There is also a need for greater investment in research and development to improve the efficiency and sustainability of charcoal production.

Charcoal is a type of fuel that is produced by heating wood in the absence of oxygen. The process of making charcoal from wood involves several steps:

Choosing the wood: the first step in making charcoal is choosing the right type of wood. Hardwoods such as oak, maple, and hickory are ideal for making charcoal because they burn longer and hotter than soft woods.

Cutting the wood: Once the wood has been chosen, it is cut into small pieces typically about 3-4 inches in diameter.

Stacking the wood: The wood is then stacked in a pile, known as the “kiln,” in a specific way to allow air to flow through the pile .

Lighting the wood: The wood at the base of the pile, is then lit on fire, and the fire is allowed to spread through the pile .

Covering the pile: once the fire has spread through the pile, it is then covered with a layer of dirt or other material to prevent oxygen from entering.

Allowing the wood to char: The wood is allowed to smolder for several hours usually, around 24 hours, until it has been converted into charcoal.

Extinguishing the fire: After the wood has been converted into charcoal, the fire is extinguished by removing the cover and dousing the pile with water.

Sorting the charcoal: The charcoal is then sorted and graded based on its size and quality.

Packaging the charcoal: Finally, the charcoal is packaged and sold for use as a fuel source in grills, smokers and other applications.

In conclusion, the use of charcoal can be cheap and sustainable if it is made from wood that is sourced from sustainably managed forests or waste wood from other industries, and produced using clean and efficient technologies. Sustainable charcoal production can provide a reliable source of income for local communities, reduce our dependence on fossil fuels, and help to protect our environment. It is up to us to promote and support sustainable charcoal production and ensure that it becomes more widespread. Thank you for listening.

In an experiment to prepare amorphous sulphur, S2 learners found out that concentration could be having an effect on the rate of formation of sulphur from sodiumthiosulphate and hydrochloric acid.



Imagine you are the laboratory technician in the school, use 0.2M sodium thiosulphate, 0.1M Hydrochloric acid and a variety of apparatus provided to design an investigation in order to help the learners verify their observation.

Thank you so much.